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The quality of procurement actions conducted by the Department of Defense can be enhanced by improving the selection procedure used to select procurement officers. Such a selection procedure should be based on demonstrated relationships between individual traits and background and potential procurement performance. In this study, 42 Air Force procurement officers who were engaged in weapon system acquisition were surveyed in an attempt to establish what relationships existed between their procurement performance, as established by supervisors' ratings, and various psychological traits and biographical items. The contents of this study include a performance measurement device and the statistical methodology involved, as well as a summary of the observed relationships.

KEY WORDS
Procurement Officer
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AN ANALYSIS OF THE RELATIONSHIPS BETWEEN INDIVIDUAL TRAITS AND JOB PERFORMANCE OF AIR FORCE PROCUREMENT OFFICERS ASSIGNED TO THE AERONAUTICAL SYSTEMS DIVISION

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AN ANALYSIS OF THE RELATIONSHIPS BETWEEN INDIVIDUAL TRAITS AND JOB PERFORMANCE OF AIR FORCE PROCUREMENT OFFICERS ASSIGNED TO THE AERONAUTICAL SYSTEMS DIVISION

A Thesis

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In Partial Fulfillment of the Requirements for the

Degree of Masters of Science in Logistics Management

by

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INTRODUCTION

Problem Statement

Armed Forces procurement personnel will obligate 36.4 billion dollars in Fiscal Year 1972.[1] In general, two factors will determine how effectively this money will be spent. These factors are: (1) the adequacy of the policies and procedures which govern procurement actions and (2) the capabilities of the personnel who implement these actions. The Department of Defense has continually tried to assure effective procurement by improving policies and procedures. The area of procurement personnel has not received the emphasis given to policies and procedures.

The selection process is an important step in the development of effective procurement personnel. Effective selection requires systematic procedures for estimating the future performance of an individual on the basis of available information at the time of selection. This prediction is based on observed relationships between the performance of individuals and the traits and backgrounds which they possessed. It is not known whether relationships exist between traits and background and procurement performance. These relationships must be identified before a meaningful selection process can be developed.

Background

Department of Defense Environment

> The Department of Defense procurement program involves approximately 12 million project actions a year. ...For Fiscal Year 1968, contracts were

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[1] Fiscal Year 1972-76 Defense Program and the Fiscal Year 1972 Defense Budget (Washington: U.S. Government Printing Office, 1971), p. 189.

awarded totaling about 43 billion dollars for supplies and services.

The complex and dynamic Defense procurement environment and the associated procurement process are characterized by a variety of significant and increasingly serious problems.[2]

The Report of the Blue Ribbon Panel states that solutions to these problems fall into two general categories: (1) improvements in policies and procedures and (2) improvements in personnel. Past and current emphasis has been on the improvement of procurement policies and procedures. For example, the total package procurement concept was an attempt to correct major flaws in the procedures through which weapon systems were acquired.[3] Another example of the emphasis placed on policies and procedures is evidenced by Deputy Secretary of Defense Packard's memorandum to the services in which he outlined five general problem areas and challenged the services to improve the acquisition process. The areas highlighted by Secretary Packard were: (1) excessive optimism in cost estimating, (2) control of changes in on-going programs, (3) comprehensive assessment of risk prior to systems development, (4) use of competitive prototypes in developments, and (5) excessive concurrency in development/test, and production.[4]

The second category of solutions deals with the improvement of procurement personnel. Members of the Blue Ribbon Panel have recognized the importance of the second category.

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[2]Report to the President and the Secretary of Defense on the Department of Defense by the Blue Ribbon Defense Panel (Washington: U.S. Government Printing Office, 1970), p. 91.

[3]Robert H. Charles, "Total Package Procurement Concept." Paper published by U.S. Government, Department of the Air Force (Washington: 1966).

[4]David Packard, Deputy Secretary of Defense: Memorandum for Secretaries of Defense: Memorandum for Secretaries of the Military Departments, "Improvements in Weapon Systems Acquisition." (Washington, 1969), p. 2.

> Regardless of how effective the overall systems of Department procurement regulations may be judged to be, the key determinants of the ultimate effectiveness and efficiency of the Defense Procurement process are the procurement personnel who have the challenging responsibility for interpreting and applying the regulations and associated guidance material. The importance of this truism has not been appropriately reflected in the recruitment, career development, training, and management of the procurement work force. As a consequence, the Department is faced with a significant number of immediate and future problems with respect to the availability in adequate numbers of appropriately qualified and capable procurement personnel. For example, major problems exist with respect to ageing, turnover, capabilities, and utilization.
>
> ...Improvement should be affected in the acquisition, training, and retention of procurement personnel, with emphasis on a promotion system for contract negotiators which will not necessarily remove them from negotiating activities.[5]

However, there has been far more effort on improving procedures than on improving personnel.

The major effort by the Air Force in personnel improvement has been project "COPPERCAP," which is a 12 point program to improve the management of the procurement career area. This project is focused on areas other than the selection of procurement personnel, such as training programs, identification of critical positions, improvement of promotion opportunities, and career progression. The program makes no effort to selectively screen those individuals who enter the procurement field, rather it emphasizes the improvement and motivation of the personnel already in the field.[6]

Description of a Procurement Officer's Function

An Air Force procurement officer occupies a staff position in his organization

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[5] Report of the Blue Ribbon Panel, pp. 94-95.

[6] U.S. Department of the Air Force, Air Force Procurement Career Development Action Plan - Project COPPERCAP, (Washington: Unpublished, December, 1970), pp. 1 - 87.

which is analogous to a position in the purchasing department in a civilian corporation. In performing his function, the procurement officer may contract for supplies and services, determine the proper type of contract, negotiate new procurements, prepare and assemble contracts, administer contracts, and review both government and contractor performance.[7] His job requires not only technical knowledge but also the ability to interact successfully with other persons both in the government and the private sector. For example, Pace, discussing contract negotiations says:

> ...To be an effective negotiator, it takes dominant personality traits and most of all, the imagination to pose alternatives or compromises. ...But most of all it takes experience, not only by doing it yourself, but by observing other negotiators in action.[8]

However, Mister Pace cites no empirical evidence on which he can base his opinions.

Review of the Literature

A review of the literature centered on two areas: techniques of measuring job performance, and the analysis of traits and biographical data as predictors of job performance. Although a wealth of information exists in these areas, no study was found which addressed itself to the procurement function. As mentioned previously, authors have expressed their opinions on the subject, but no actual research has been completed.

The literature indicated that the development of a criterion for measuring

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[7] U.S. Department of the Air Force, Classification of Officer Specialty, AFM 36-1 (Washington: U.S. Government Printing Office, 1968), pp. A14-35 through A14-40.

[8] Dean F. Pace, Negotiations and Management of Defense Contracts (New York: John Wiley & Sons, Inc., 1970), p. 113.

job performance becomes more difficult as the job being measured becomes more complex. Criterion measures have been developed and used by industry for measuring less complex jobs such as typists, salesmen, and assembly-line workers. Objective output measures can readily be developed for these jobs, for example, words typed per minute, sales volume per unit time, rejects per day.[9]

Studies in the area of predicting success in managers have pointed to the problem of developing techniques for measuring their performance.[10] These difficulties arise due to the complexity of the manager's job and to the fact that much of a manager's work is based on interpersonal relationships. These same factors are important dimensions of the procurement officer's job and thus hinder the assessment of his performance by objective output measures.

Due to the difficulty in establishing objective measures of a manager's performance, most researchers have relied on a supervisory rating of one form or another as a performance measurement. One such system is described by Professor Wilbert Steffy and Daniel R. Darby.[11] Work with supervisory ratings has shown that they are subject to such errors as the halo effect, that is the tendency of a rater to rate an individual about the same in all aspects of his job because of a general overall impression. Another error is that of a central tendency in which a

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[9] Robert E. Krug, "Personnel Selection" in Industrial Psychology, ed. B. vor Haller Gilmer (New York: McGraw-Hill, Inc., 1961), pp. 108-112.

[10] John P. Campbell et al, Managerial Behavior, Performance and Effectiveness (New York: McGraw-Hill, Inc., 1970), p. 71.

[11] Wilbert Steffy and Daniel R. Darby, Performance Evaluation Systems (Ann Arbor: The University of Michigan, 1969) pp. 1-34.

rater will tend to avoid extreme ratings in either direction. The literature reveals techniques to minimize these errors, such as a method of rank order, paired comparison, and forced distribution.[12]

The area of predictors of success for a given job has also received much attention from industrial psychologists. The earliest work in this area was also done for simple production oriented jobs. Early testing centered around general measures of intellectual ability and measures of sensory and psychomotor abilities. These efforts have been highly successful.[13]

The area of predicting management performance has again illustrated the difficulty of analyzing complex jobs. Researchers have attempted to predict success using such traits as intelligence, initiative, self-assurance, and decisiveness. Prediction of management performance has not been as successful as that of less complex jobs.[14]

The literature also indicated several measurement devices which may prove to be predictors of procurement performance. These devices include personal history analysis, using such information as age, education, and experience. In addition, the assessment of psychological traits may also be useful.

For example, Marvin E. Shaw has developed a scale for measuring

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[12]Robert M. Guion, Personnel Testing (New York: McGraw-Hill, Inc., 1961), pp. 97-98.

[13]Leonard W. Ferguson, "The Development of Industrial Psychology" in Industrial Psychology, ed. Gilmer, pp. 19-32.

[14]Edwin F. Ghiselli, "Predictions of Success in Stockbrokers," Personnel Psychology XXII (Summer, 1969), 125-130.

"individual prominence," which measures the extent to which an individual will attempt to be the prominent member of the small group in which he is working.[15] A procurement officer typically works in small groups engaged in contract negotiation, arbitration, and so forth. It is reasonable to assume that the officer's attempts to influence such groups may have a direct bearing on his performance.

In addition, James E. Crandall has developed a test which measures "tolerance of disagreement," that is, the extent to which an individual can psychologically tolerate disagreement or conflict of opinion between himself and others.[16] A procurement officer's duties as a contract negotiator, arbitrator, and so forth necessarily place him in a position of "disagreement" with bidders, contractors, etc. It may therefore prove fruitful to investigate the relationship between a procurement officer's tolerance of disagreement and his job performance.

Although the literature did not deal specifically with the problem of predicting procurement performance, it did provide essential background in two major areas. The first area was the problems and techniques of developing a performance measuring instrument. The second area was the development of devices to measure biographical data and traits.

Scope

General

A concurrent study was performed which was limited to procurement

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[15] Marvin E. Shaw, "Behavior in Groups: The Development of a Scale to Measure Individual Prominence," in Decisions, Values and Groups, ed. Dorothy Willner (London: Pergamon Press, 1960) pp. 149-153.

[16] James E. Crandall, "Self Perception and Interpersonal Attractions as Related to Tolerance -Intolerance of Ambiguity," Journal of Personality XXXIX (March 1969 - December 1969), 127-140.

officers who were commissioned officers assigned to the Aeronautical Systems Division. That is, since it was not feasible to test a large group of new procurement officers before they entered their careers and to subsequently measure their performance, the methodology employed was to measure the subjects' traits and performance concurrently. A further limitation was that only a few predictors were chosen out of a wide range of possibilities.

Aeronautical Systems Division

The Aeronautical Systems Division is a major division of the Air Force Systems Command and is located at Wright-Patterson Air Force Base, Ohio. Major General Lee V. Gossick, Commanding General of ASD has stated

> ...ASD is responsible for creating the aerospace weapon systems for tomorrow's Air Force. In pursuing this task, the division and its contractors address themselves to the whole range of conception, development, procurement and testing.
>
> ...Currently, the division annually awards about 6,500 contracts to the aerospace industry -- companies both large and small. These contracts total more than $6 billion, and represent more than half of the Air Force Systems Command (AFSC) annual budget.[17]

The officers included in this study were all involved in the acquisition of Air Force weapon systems.

ASD is organized into Systems Program Offices (SPO) supported by functional offices. A SPO is responsible for the development and acquisition of a specific weapon system or subsystem. The functional organization supports the

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[17] Lee V. Gossick, Major General, USAF, "Aeronautical Systems Division: Weapon Systems for Tomorrow's Air Force," Defense Industry Bulletin VI (February, 1970) p. 15.

SPO's in the accomplishment of their mission. For example, the Directorate of Production and Procurement consists of a pool of procurement officers who assist a given SPO as required.

Objectives

The primary objective of this thesis was to determine if relationships exist between job performance of Aeronautical Systems Division procurement officers and selected dimensions of their traits and backgrounds.

In order to satisfy the primary objective, the following sub-objectives were established: (1) a scale and technique for measuring job performance of procurement officers must be developed; (2) a scale and technique for measuring traits and backgrounds of procurement officers must be developed; (3) the information gained from the measurements previously described must be analyzed to determine the nature of the relationship between each trait and job performance.

Hypothesis and Research Questions

In order to accomplish the primary objectives, the following hypothesis was tested, "The quality of an individual's job performance can be related to his biographical data or his psychological traits or both."

This hypothesis will be examined by answering the following research questions:

(1) Can a measurement device be developed which will accurately measure a procurement officer's performance, based on a supervisor's rating?

(2) Is a procurement officer's performance, as defined by the measurement device, statistically related to the officer's biographical data, that being age, rank, length of service, procurement experience, educational experience and source of

commission, or to his psychological traits of individual prominence and tolerance of disagreement?

(3) Is a procurement officer's performance, as defined by the measurement device, statistically related to combinations of his biographical data and psychological traits?

Chapter 2

METHODOLOGY

Data Collection

Nature of the Sample

There are approximately 1600 Air Force officers in the procurement field. They are assigned throughout the world in various commands and their widely differing tasks and responsibilities make comparisons difficult. Therefore, it was necessary to limit this study to a group of individuals who belong to the same organization so that the many other variables which effect job performance could be minimized. For these reasons, Air Force procurement officers assigned to the Aeronautical Systems Division were selected as the subjects of this study.

There are approximately 110 procurement officers, varying in rank from lieutenant to lieutenant colonel, assigned to ASD. Of these 110, a total of 42 subjects were chosen in such a way as to minimize the number of rating supervisors. The sample consisted of all procurement officers assigned to five major organizations, as shown in Table 1. The five organizations, (A through E), consisted of three systems program offices and two functional departments.

Measurement Devices

The measurement of both job performance and traits and biographical data was accomplished with questionnaire techniques.

Criteria Measurement: In order to measure the performance of the procurement officers, a rating scale, consisting of 24 items, was developed. These items were drawn primarily from the study conducted by Professor Steffy and

Table 1

Composition of Subject Sample
by Organization and Rank

Organization	Rank				Totals
	Second Lieutenant	First Lieutenant	Captain	Major	
A	1	0	1	1	3
B	0	3	6	4	13
C	0	1	4	0	5
D	5	3	4	0	12
E	1	0	8	0	9
Totals	7	7	23	5	42

D. R. Darby.[1] The questions deal with five major dimensions of a procurement officer's job. Each of the categories was described in terms of a procurement officer whose past performance was representative of the description below.

Price:	The officer is outstanding in finding and negotiating the lowest price for goods.
Quality:	The officer is outstanding in procuring goods of high quality.
Suitability:	The officer is outstanding in finding goods that are best suited in terms of their intended use.
Delivery:	The officer is outstanding in having his goods delivered on time, causing no problems with production or planning.
Management:	The officer is outstanding in aiding the organization and his supervisor in the efficient operation of the organization.

In completing the rating scale, raters responded by evaluating the subjects on a nine point rating scale, for each item. The scale provided a rating of 8 or 9 for outstanding performance; 5, 6 or 7 for superior performance; 2, 3 or 4 for good performance; and 0 or 1 for fair performance. A copy of the questionnaire is included in Appendix A.

In addition, each supervisor completed a performance weighting scale in which he evaluated the relative importance of each of the five dimensions of performance. Each supervisor also rank ordered, in terms of job performance, all of

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[1]Wilbert Steffy and Daniel R. Darby, Performance Evaluation Systems (Ann Arbor: The University of Michigan, 1964), pp. 5-34.

[2]Steffy, Performance Evaluation Systems, p. 18.

the offices that he supervised. A copy of this instrument is included in Appendix B.

Predictor Measurement: Trait and biographical data was collected from each subject by means of the questionnaire included in Appendix C. This questionnaire included items pertaining to the subject's age, rank, length of military service, procurement experience, educational background, and technical training.

This questionnaire also incorporated a 24 item test which had been developed and validated by Marvin E. Shaw. This test measured each subject's "individual prominence," defined as the extent to which an individual will attempt to become the prominent member of a group.[3]

This instrument also incorporated an eight item test which had been developed and validated by James E. Crandall.[4] The test was designed to measure an individual's tolerance or intolerance of disagreement. That is, this test measures the degree to which an individual can tolerate open disagreement with others.

Administration Procedures

Each rater was personally interviewed by the authors at which time the nature of the study was discussed. The rater was asked to complete a "Job Performance Rating Scale" on each of his subordinates, and to complete the "Dimensions of Procurement" instrument and the "Overall Performance" instrument. Each subordinate was asked to complete a "Procurement Officer Survey" form.

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[3]Marvin E. Shaw, "Behavior in Groups: The Development of a Scale to Measure Individual Prominence," in Decisions, Values and Groups, ed. Dorothy Willner (London: Pergamon Press, 1960), pp. 229-240.

[4]Crandall, "Self Perception and Interpersonal Attractions as Related to Tolerance-Intolerance of Ambiguity," pp. 127-140.

Data Analysis

Organization of the Raw Data

Scoring of the Criterion Measuring Device: The raw data provided by the criterion measurement device consisted of the supervisor's responses to the 24 questions on the "Job Performance Rating Scale," as well as his five responses to the "Dimensions of Procurement" instrument. For each subject this data was scored in two different ways.

Initially, the responses to the "Job Performance Rating Scale" were aggregated into a raw score for each dimension of procurement. These five dimensions and the corresponding item numbers are presented in Table 2. An individual's raw score for each dimension was computed as the sum of the responses for that dimension divided by the number of responses for that dimension. That is, an individual's raw score for each dimension is the average score he received on all the responses for that dimension.

In the "Dimensions of Procurement" instrument the supervisor was asked to express his opinion of the relative importance of each of the five dimensions of procurement by assigning a "percentage" of importance to each dimension in such a way that the sum of the percentages would equal 100 percent. These responses were used to develop the two different weighting factors. By converting these percentages to decimal fractions, the "Individual Weighting Factors" were computed. In addition, an "Overall Weighting Factor" was computed for each dimension. Each "Overall Weighting Factor" was calculated as the average response of all the supervisors for that dimension on the "Dimensions of Procurement" instrument.

Each subject then received an "Individually Weighted Score" and an

Table 2

Job Performance Rating Items Categorized by Procurement Job Dimension

Procurement Job Dimension	Item Numbers
Price	2, 7, 11, 15
Quality	4, 5, 9, 17
Suitability	10, 13, 19, 21
Delivery	8, 16, 20
Management	1, 3, 6, 12, 14, 18, 22, 23, 24

"Overall Weighted Score." The "Individually Weighted Score" was computed as the sum of the five average raw scores times the respective "Individual Weighting Factor" for that subject. The "Overall Weighted Score" was computed as the sum of the average raw scores multiplied by the respective "Overall Weighting Factor."

Thus, the criterion measurement devices yielded two measurements of performance for each individual: (1) the "Individually Weighted Score," and (2) the "Overall Weighted Score." The first score for each individual is composed solely of an individual supervisor's opinion of the subject's performance in each dimension and of the relative importance of that dimension. The "Overall Weighted Score" is based on the supervisor's impression of the subject's job performance in each dimension, but the relative importance of that dimension is a consensus figure developed from the opinions of all the supervisors.

Scoring the Predictor Measuring Device: The raw data provided by the predictor measurement device consisted of an individual's responses to the "Procurement Officer Survey" instrument. These responses included selected items of biographical data as well as responses to the 24 item test of "Individual Prominence" and the eight item test for "Tolerance of Disagreement." The composition of the "Procurement Officer Survey" is shown in Table 3.

Responses to the test items consisted of a number from 1 to 5. The score for each test was the sum of the responses for all the items on that test, with the responses to negatively scored items reversed. That is, on negatively scored items (see Table 3) a response of 1 was scored as 5, 2 was scored as 4, and so forth.

Thus, an individual's score for "Individual Prominence" could range from a low of 24 indicating low prominence, to a high of 120. Scores for the

Table 3

Composition of "Procurement Officer Survey"

Predictors	Item Numbers
Biographical Data	1 through 10 (Items 1 through 4 yield ordinally scaled data. Items 5 through 10 yield nominally scaled data.)
Individual Prominence	11 through 34 (Items 14, 15, 18, 21, 28, 31, 33 scored negatively)
Tolerance of Disagreement	35 through 42 (Items 36, 39, 40, 42 scored negatively)

"Tolerance of Disagreement" test could range from a low of 8 to a high of 40, with a low score indicating tolerance of disagreement and a high score indicating intolerance of disagreement.

Statistical Analysis

Scales of Measurement: The analysis of statistical data is dependent upon the scale of measurement of the data. Biographical data such as type of degree, source of commission, undergraduate major and current enrollment in a college course are clearly nominal in nature. Other biographical data such as age, rank, years of service, years of experience in procurement, and total number of procurement courses attended are clearly ordinal in nature if not in fact interval.

The data generated by rating scales is variously treated as ordinal or interval data. However, Ghiselli has outlined a number of reasons to treat data gathered in this way as interval in scale.[5] Therefore, data such as individual prominence, tolerance of disagreement, individually weighted performance score and overall weighted performance score were treated both as ordinal data and as interval data. Statistical inferences which are based on the assumption of ordinal scale of measurement are therefore conservative. Treating this data as interval in nature allows the use of much more powerful statistical tools.

Analysis of Criterion Measurement Devices: In order to answer the research question, "Can a measurement device be developed which will accurately measure a procurement officer's performance, based on a supervisor's rating?",

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[5] Edwin E. Ghiselli, Theory of Psychological Measurement (New York: McGraw-Hill, Inc., 1964), p. 131.

the measurement instrument was analyzed with respect to validity and rater bias.

The measurement device can be considered to be valid if the scores it provides reflect the rater's rank ordering of the subject's performance. There were two instances in the sample where one supervisor rated more than five subjects. Each supervisor performed a forced-choice rank ordering of the individuals he rated (Appendix D). These rankings were compared both to the individually weighted performance scores and to the overall weighted performance scores through the computation of a Spearman Rank Correlation Coefficient.[6] The strength of these correlations indicated the accuracy of the measurement device.

The comparison of performance scores provided by the different raters is based on the assumption that each rater would rate a given individual the same if given the opportunity. However, this is not always the case. This type of rater bias has been described as "leniency."[7] That is, some raters will tend to rate all individuals relatively high while other raters tend to rate all individuals relatively low. To determine the extent of rater bias, a Chi-Square test for independence was performed.[8] If there was no rater bias present, each rater would be expected to rate half his subjects above the median performance score and half below. Divergence from this pattern can be attributed either to rater bias or to the fact that his subordinates were in fact superior to the group as a whole. Since officers

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[6]Sidney Siegel, Nonparametric Statistics for Behavioral Sciences, (New York: McGraw-Hill, Inc., 1956), pp. 202-213.

[7]Robert M. Guion, Personnel Testing, (New York: McGraw-Hill, Inc., 1965), pp. 99.

[8]Siegel, Nonparametric Statistics, pp. 42-47.

are assigned to ASD one at a time as vacancies occur, and since no effort is made to concentrate superior personnel in any specific department, it is most unlikely that the median performance score for any sizable department would differ from the overall group median. Thus any significant differences can be attributed to rater bias.

In order to correct performance score for possible rater bias, an adjusted performance score was calculated for subjects whose supervisors rated three or more subjects. An overall average score was computed as well as the average score assigned by each supervisor. The difference between these two means was then added to each performance score. For example, if the overall average score were 70, and the average score assigned by a specific supervisor were 80, then a subject scored by that supervisor who had a score of 92 would have an adjusted score of 82, since $92 + (70 - 80) = 82$.

Analysis of Nominal Data: If a specific item of nominally scaled biographical data was not related to an individual's performance, then half of the subjects in any given category would be expected to score above the median in performance and half below. The Chi-Square test was performed for each of the four items to determine the significance of the observed patterns.

Analysis of Ordinal Data: The assumption of ordinal scaling permits a rank ordering of the subjects in terms of the performance scores and individual prominence scores, tolerance of disagreement scores and ordinally scaled biographical data. If a trait or biographical item were related to performance, then it would be expected that the rank ordering of the subjects in terms of performance would be similar to their rank ordering in terms of the predictor measurement. A

Spearman Rank Correlation Coefficient was computed to measure the degree of similarity between the rankings, and hence the strength of the relationships between criteria and predictors.

Analysis of Interval Data: The assumption of interval scaling allows the data to be plotted on coordinate axes. The least squares linear regression[9] was performed on each intervally scaled predictor to determine the nature and extent of the relationship between that predictor and performance scores. Correlation coefficients were calculated to determine the strengths of the relationships.

In order to compare the individually weighted and overall weighted performance scores, a regression analysis was also performed on the two scores. To determine if predictor items were independent of one another, regression analysis was performed between the various predictors. Finally, a multiple regression analysis[10] was performed on the performance measures and those predictors which were most strongly related to performance.

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[9] E. J. Williams, Regression Analysis (New York: John Wiley & Sons, Inc., 1959), pp. 10-22.

[10] Williams, Regression Analysis, pp. 23-59.

Chapter 3

RESULTS

Performance Measurement

The "Overall Weighting" factors which were calculated from the "Dimensions of Procurement" instrument are presented in Table 4. These factors were used in calculating the "Overall Weighted Score." These factors, which represent the consensus of opinion of all the supervisors involved in the study, demonstrate that "price" was identified as the most important dimension of procurement, but it should also be noted that no specific dimension was isolated as being either paramount in importance or as being relatively unimportant.

The performance scores of all subjects are included in Appendix D. Adjusted scores were calculated for only those subjects whose supervisors rated three or more subjects; thus adjusted scores were calculated for only 29 of the 42 subjects. These scores are summarized in Table 5.

Table 5 also includes the results of the analysis of rater bias for each performance measure. The Chi-Square test for independence yielded a significance level which estimated the probability of obtaining the observed distribution of scores if there were no rater bias present. Therefore a small significance figure strongly indicates the presence of rater bias in the measurement. It can be seen in Table 5 that the adjustment procedure did not appreciably affect the means of the individually weighted or overall weighted scores. However, the range and the standard deviation of those scores was considerably reduced by the adjusted procedure.

The Spearman rank correlation coefficient between supervisors' impressions

Table 4

Overall Weighting Factors derived from "Dimensions of Procurement"

Dimension	Average Weight
Price	30%
Quality	15%
Suitability	19%
Delivery	14%
Management	22%
Total	100%

Table 5

Statistical Summary of
Performance Scores

Statistics	Performance Scores			
	Individually Weighted	Overall Weighted	Adjusted Individually Weighted	Adjusted Overall Weighted
Mean	69.90	67.80	69.20	67.70
Standard Deviation	13.22	10.94	7.82	4.63
Minimum	37.00	45.00	53.00	56.00
Maximum	87.00	82.00	83.00	82.00
Significance level of Rater Bias	.005	.005	.50	.75

Note: Sample size is 42 for the Individually and Overall Weighted scores and 24 for the Adjusted scores.

and the individually weighted performance scores was .845. The Spearman rank correlation coefficient between supervisors' impressions and the overall weighted performance score was .912. A correlation coefficient derived from a regression of the individually weighted performance scores to the overall weighted performance was .927. All three of these correlations were significant at a level of .005 or better. This indicates that a rank ordering of individuals according to supervisors' impressions, for example, is very similar to a rank ordering of individuals according to the individually weighted performance scores. The significance level indicates that rank orderings as similar as these would be observed no more than once in 2,000 trials if the rank orders were in fact random and independent.

Analysis of Nominal Predictor Data

Nominal predictor data included the highest academic degree that each subject held, his undergraduate major field of study, his current enrollment status in a college level course, and his source of commission. Analysis of this data was based on the individually weighted performance scores. The results of these analyses are presented in Tables 6 through 9.

The subjects' responses to his highest academic degree held, as shown in Table 6, were so varied that an analysis could not be performed which considered each individual category. Therefore, the categories were combined into baccalaureate and advanced degrees. The category entitled "Other Advanced Degrees" included subjects who held degrees in law and specialized masters degrees. The significance level determined from this analysis indicates that the probability of obtaining the observed distribution of scores if there were no difference in the mean performance scores of individuals with advanced and

Table 6

Categorization of Procurement Officers by Above and Below Average Performance and by Highest Academic Degree Held

Performance	Undergraduate		Advanced			Total Bachelor	Total Advanced
	Bachelor of Science	Bachelor of Arts	Master of Science	Master of Business Administration	Other		
Above Average in Performance	9	0	5	5	2	9	12
Below Average in Performance	10	4	0	3	4	14	7
Totals	19	4	5	8	6	23	19

Note: The distribution of Total Bachelor and Total Advanced degrees is significant at the .15 level.

Table 7

Categorization of Procurement Officers by Above and Below Average Performance and by Undergraduate Major

Performance	Business Related Major				Non-Business Related Major				Total Business Related	Total Non-Business Related
	Bus (a)	Actg	Mktg	Econ	Soc Sci	Phys Sci	Eng	Other		
Above Average in Performance	5	3	2	1	1	1	3	5	11	10
Below Average in Performance	8	1	1	3	0	1	2	5	13	8
Totals	13	4	3	4	1	2	5	10	24	18

Note: The distribution of the Total Business Related and Total Non-Business Related majors is significant at the .75 level.

(a) College Majors abbreviated are Business, Accounting, Marketing, Economics, Social Science, Physical Science, and Engineering.

Table 8

Categorization of Procurement Officers by Above and Below Average Performance and by Current Enrollment in a College Course

Performance	Enrollment		
	Undergraduate Course	Graduate Course	Not Enrolled
Above Average in Performance	0	4	17
Below Average in Performance	2	2	17
Totals	2	6	34

Table 9

Categorization of Procurement Officers by Above and Below Average Performance and by Source of Commission

Performance	Source of Commission		
	Reserve Officer Training Corps	Officer Training School	Service Academy
Above Average in Performance	12	6	3
Below Average in Performance	11	8	2
Totals	23	14	5

bachelor degrees was .15.

The undergraduate majors reported by the subjects were also distributed among many categories as shown in Table 7. For purposes of analysis, therefore, these categories were combined into "Business Related Major" and "Non-Business Related Major," where business related majors included the categories of Business, Accounting, Marketing, and Economics. A significance level of .75 was thus achieved, that is, observations such as these could be expected in 3 out of 4 trials if in fact the average performance of individuals with business majors was equal to the average performance of individuals with non-business majors.

Subjects' responses to current enrollment in academic courses and to source of commission are summarized in Tables 8 and 9 respectively. The frequency of responses observed in each category for both of these items indicates that there is no significant difference in the performance of the subjects based upon these categorizations.

Predictor Measurement

The responses to the "Procurement Officer Survey" instrument are included in Appendix E. There were so few responses to item number 5, "Types of Procurement Assignments," i.e. Base or Depot Level assignments, that this item could not be meaningfully evaluated, and it was therefore not included in the results. These responses are summarized in Table 10.

Correlation of Predictor and Performance Measurements

Analysis of the results based on the assumption that the performance scores were ordinally scaled data precludes the use of the adjusted performance scores since the adjustment procedure was based on the assumption that these scores

Table 10

Statistical Summary of Predictor Responses

Statistics	Predictor Responses					
	Age	Years of Military Service	Years in Procurement Field	Technical Training (total courses)	Individual Prominence	Tolerance of Disagreement
Mean	28.70	6.70	3.50	.80	58.60	20.70
Standard Deviation	3.85	4.38	2.70	.97	8.54	3.94
Minimum	23	1	1	0	36	12
Maximum	35	14	10	4	77	29

were interval in scale. The observed correlations between the ordinally ranked predictor data and performance scores are shown in Table 11. As can be seen from the table, the strongest correlations were observed between the performance scores and the biographical items of age, rank, and years of military service.

The assumption that predictor and performance data is intervally scaled permitted analysis of correlations computed using regression techniques. The strength and nature of relationships between predictor items as measured by the correlation coefficients between these items are shown in Table 12. The strongest correlations were observed between the biographical items of age, rank, and years of military service.

The correlation coefficients derived from simple linear regression between each of the four performance scores and each item of predictor data are presented in Table 13. Analysis of the adjusted overall weighted score produced no significant correlation with any of the predictor items.

A multiple correlation coefficient was also calculated for each of the four performance scores. To accomplish this, a multiple regression was performed between the items of predictor data and each performance score. In using this technique the inclusion of an additional predictor item will increase the multiple correlation coefficient, however, if the individual correlation of the included item is not strong, the inclusion of that item will reduce the significance of the multiple correlation coefficient. Therefore, only those items of predictor data were included in the regression computation which would not reduce the significance of the resulting multiple correlation coefficient below a level of .10. The multiple correlation coefficients thus computed are presented in Table 14. It was

Table 11

Spearman Rank Correlation Coefficients between Predictors and Performance Scores

Predictor	Performance Scores	
	Individually Weighted	Overall Weighted
Age	.379**	.325**
Rank	.448**	.368**
Years of Military Service	.365**	.273**
Years in Procurement Field	.218*	.203*
Technical Training	-.167	-.153
Individual Prominence	-.057	.075
Tolerance of Disagreement	.019	.020

*Significant at .10 level
**Significant at .05 level

Note: Sample size is 42.

Table 12

Inter-predictor Correlation Coefficients Derived from Simple Linear Regression

	Age	Rank	Years of Military Service	Years in Procurement Field	Technical Training	Individual Prominence	Tolerance of Disagreement
Age	-	.669	.911	.463	.070	.125	.200
Rank		-	.473	.454	.107	-.127	.019
Years of Military Service			-	.384	-.084	-.211	.181
Years in Procurement Field				-	.375	-.007	.071
Technical Training					-	.060	.105
Individual Prominence						-	.054
Tolerance of Disagreement							-

Note: Correlation Coefficients larger than .217 are significant at the .10 level.
Correlation Coefficients larger than .260 are significant at the .05 level.
Sample size is 42.

Table 13

Correlation Coefficients between Predictors and Performance Scores Derived from Simple Linear Regression

Predictor	Performance Scores			
	Individually Weighted	Overall Weighted	Adjusted Individually Weighted	Adjusted Overall Weighted
Age	.311**	.270**	.273*	.067
Rank	.428**	.354**	.374**	.159
Years of Military Service	.264**	.217*	.224	.052
Years in Procurement Field	.243*	.219*	.367**	.235
Technical Training (total courses)	-.258**	-.308**	.179	.128
Individual Prominence	-.096	-.008	-.081	.067
Tolerance of Disagreement	-.038	-.021	.183	.094

*Significant at .10 level
**Significant at .05 level

Note: Sample size for Individually and Overall Weighted scores is 42 and 29 for the Adjusted scores.

Table 14

Correlation Coefficients between Predictors and Performance Scores Derived from Multiple Regression

Performance Score	Multiple Correlation Coefficient	Predictors Used in the Computation						
		Age	Rank	Years of Military Service	Years in Procurement Field	Technical Training (total courses)	Individual Prominence	Tolerance of Disagreement
Individually Weighted	.575**	X	X	X	X	X		X
Overall Weighted	.555**	X	X	X	X	X	X	
Adjusted Individually Weighted	.469*		X		X			X
Adjusted Overall Weighted	.235				X			

*Significant at the .10 level
**Significant at the .05 level

found that no combination of predictor variables resulted in a multiple correlation coefficient with a significance of .10 or better with respect to the adjusted overall weighted score. It can be noted from Tables 13 and 14 that the predictor item, "Years in the Procurement Field," is the only predictor variable which is used in all four multiple regression computations, although it is not necessarily the most strongly correlated variable in each regression.

Chapter 4

CONCLUSIONS

Hypothesis Testing

The primary objective of this thesis was to determine whether relationships exist between job performance of Aeronautical Systems Division officers and selected dimensions of their traits and backgrounds. To accomplish this objective, the following hypothesis was tested; "The quality of an individual's job performance can be related to his biographical data or his psychological traits or both." The examination of this hypothesis consisted of answering three research questions.

Research Question Number One

The first research question was, "Can a measurement device be developed which will accurately measure a procurement officer's performance, based on a supervisor's rating?" The 24 item "Job Performance Rating Scale" (Appendix A) was developed and was completed for 42 procurement officers. The scoring of these questionnaires resulted in the "Individually Weighted Score" for a subject which was based only on the opinion of that subject's supervisor, and the "Overall Weighted Score" for a subject which was based on his supervisor's opinion, but modified by the opinions of all the supervisors who participated in the study. Each of these performance scores very accurately reflected the rank ordering of subjects provided by supervisors on the "Overall Performance" instrument. However, the presence of rater bias in both of these scores indicated that comparisons of the performance of subjects who were rated by different supervisors could not be considered accurate. The adjustment procedure, which

was used to eliminate the rater bias in the scores, did not affect the rank ordering which each supervisor assigned to the subjects that he rated. It was therefore concluded that the adjusted individually weighted scores computed from the measurement device accurately measure the relative performance of the subjects and are free of rater bias.

It was also concluded that the application of both the overall weighting and the adjustment procedures, which resulted in the adjusted overall weighted score, so reduced the influence of an individual's supervisor on his rating, and so compressed the range of these ratings and reduced their dispersion, that the resulting performance measure could not discriminate between the perfomance of the subjects.

Research Question Number Two

The second research question was, "Is a procurement officer's performance as defined by the measurement device, statistically related to the officer's biographical data, that being age, rank, length of service, procurement experience, educational experience, and source of commission, or to his psychological traits of individual prominence and tolerance of disagreement?" Procurement officers were categorized according to their educational level, undergraduate major field of study, current enrollment in an academic course, and source of commission. It can be concluded from the results that procurement officers who possess advanced degrees tend to be superior in performance to those officers who possess a baccalaureate degree. With respect to undergraduate fields of study, the findings indicate that there is no significant difference between the performance of procurement officers with business oriented degrees

and the performance of those officers with degrees not related to the business field. The findings fail to indicate any relationship between performance and current enrollment in an academic course. In addition, the findings did not indicate that any particular source of commission was related to superior performance.

The remaining items of biographical data, age, rank, years of military service, years in the procurement field and technical training, and the psychological traits, individual prominence and tolerance of disagreement, were treated both as ordinally scaled data and as intervally scaled data, as were the individually weighted and overall weighted performance scores. The ordinal treatment, which used the Spearman rank correlation technique, indicated that age, rank, years of military service and years in the procurement field were significantly related to performance, while technical training, individual prominence and tolerance of disagreement were not. In addition, the correlations between the individually weighted score and a predictor and the overall weighted score and that predictor were almost identical. The interval analysis of these predictors and performance scores, which resulted in correlation coefficients derived from regression techniques, produced results which closely paralleled those produced by the ordinal treatment. This similarity can be seen in Table 15 which summarizes these results. The similarity of these results indicates the assumption of intervally scaled data is justified.

The problem with results thus achieved is that the correlation coefficients were derived using individually weighted and overall weighted performance scores. It has been demonstrated that there is rater bias present in these scores.

Table 15

Summary of the Results of the Analysis of Ordinal Data and of Interval Data

Predictor	Correlation Coefficients			
	Ordinal Analysis (Spearman Rank)		Interval Analysis (Regression)	
	Individually Weighted Score	Overall Weighted Score	Individually Weighted Score	Overall Weighted Score
Age	.379**	.325**	.311**	.270**
Rank	.448**	.368**	.428**	.354**
Years of Military Service	.365**	.273**	.264**	.217*
Years in Procurement Field	.218*	.203*	.243*	.219*
Technical Training	-.167	-.153	-.258**	-.308**
Individual Prominence	-.057	.075	-.096	-.008
Tolerance of Disagreement	.019	.020	-.038	-.021

*Significant at the .10 level
**Significant at the .05 level

However, since the assumption of interval data is justified, analysis based on the adjusted individually weighted performance scores can be made.

The results of this analysis indicate that on an individual basis the predictors of age, rank, years in the procurement field, and technical training are significantly correlated to performance. The correlations found between the predictors of years of military service, individual prominence, and tolerance of disagreement and performance could not be considered statistically significant on an individual basis.

Research Question Number Three

The third research question was, "Is a procurement officer's performance, as defined by the measurement device, statistically related to combinations of his biographical data and psychological traits?" The multiple regression analysis resulted in a multiple correlation coefficient of .469 between the predictors of rank, years in the procurement field, and tolerance of disagreement and the adjusted individually weighted performance score. This correlation is significant at the .10 level. This result indicated that combinations of predictors, including both biographical data and psychological traits, are related to procurement performance.

Chapter 5

IMPLICATIONS AND RECOMMENDATIONS FOR FURTHER STUDY

Performance and Predictor Measurement

The presence of rater bias in both the "Individually Weighted" and "Overall Weighted" performance scores can most probably be attributed to the fact that only one rating was used to establish a subject's performance score. As a result of this bias, the use of a somewhat artificial adjustment procedure was deemed necessary. A more precise and less artificial technique would be to consider several ratings completed by several different supervisors for each individual. In this way, the effects of rater bias would be minimized in the ratings themselves. To utilize ratings contributed by several different supervisors for each subject, a study of procurement officers would necessarily encompass several years. Unfortunately, a study of this duration was beyond the scope of this thesis.

Although all the subjects surveyed in this study were procurement officers involved in weapon systems acquisition, there was still a certain amount of variation in the duties and requirements of each officer's job. Some were contract negotiators, others were primarily price analysts, others were contract administrators, and so forth. It is possible that the biographical attributes and the psychological traits which were investigated in this study would correlate differently with the performance of contract negotiators, price analysts, and so forth. If this were the case the inclusion of these procurement officers with differing jobs may have obscured the underlying relationships.

It is therefore recommended that further studies in this area include performance ratings contributed by several supervisors over a period of years. Since ratings such as these are gathered in the form of Officer Effectiveness Ratings (OER's), further research should include an investigation of the possible utility of these ratings. It is also recommended that further investigation in this area identify and analyze specific funtions of the procurement field such as contract negotiation, price analysis, and contract administration. It is also recommended that additional studies of this nature include procurement officers assigned to different organizations throughout the Air Force.

The analysis of predictor data indicates that several items of biographical data are highly intercorrelated. Since this is the case, it may be necessary to examine a large number of different biographical items in addition to those examined in this study in order to obtain predictor items which are relatively independent of one another.

It is also apparent that this thesis did not exhaust the number of psychological traits which may be related to procurement performance. It is hoped that further study would expand the area of investigation to include such other traits as aggressiveness, decisiveness, intelligence, and self-assurance. Another important dimension of personality which should be addressed is that of motivation.

Predictive Relationships

The study indicates that relationships between an officer's performance and certain items of his biographical data such as type of degree, undergraduate major field of study and so forth, which are categorizations, can be statistically

significant. However, when the number of categories of such an item is large, for example, undergraduate major field of study, a statistical analysis which considers all categories can only be performed if the number of subjects involved in the study is quite large. In general, the significance of the results of all the statistical tests and techniques used in this study would have been enhanced by increasing the number of subjects participating in the study.

The results of this study indicated that the four biographical items of age, rank, years of military service, and years in the procurement field were similarly correlated to performance. It was also found that these four predictor items are strongly intercorrelated. Although it is possible that each of these variables could be independently correlated to performance, it appears far more likely that one of these variables was independently linked to performance, and that the other three variables correlated to performance merely due to intercorrelation with that variable. In order to determine if this effect occured, it would be necessary to analyze the effect of one predictor variable on performance while holding the other variables constant. For example, to fully investigate the relationships between age, rank, and performance a series of regressions should be performed between performance and rank for subjects who were the same age, and conversly, between performance and age among subjects who held the same rank. An analysis of this nature would demand a very large number of subjects, since it would require a large number of subjects who were the same age, and a large number of subjects who held the same rank.

It should be pointed out that one of the predictors that correlated most strongly with performance was procurement experience, that is, "years in the

procurement field," and that this "predictor" obviously cannot be used in the selection of new procurement officers. Since the subjects of this study did possess varying amounts of procurement experience, however, it was necessary to recognize the variable and measure it in an attempt to isolate its importance. Nevertheless, it is also interesting to note that the relationship between procurement experience and procurement performance was no where near as strong as might have been anticipated. This strongly indicates that other biographical or psychological variables may have a major impact on procurement performance.

Another implication can be drawn from the finding that there was no significant correlation between technical training and performance, while the performance of subjects who held advanced degrees was superior to the performance of those subjects who held baccalaureate degrees. Thus it appears that a procurement officer derives more benefit from advanced academic education than from technical training.

Further implications can also be drawn from the intercorrelation of predictor variables. In a case such as that observed between age and rank in this study, where two predictor variables were highly intercorrelated and were nearly equally correlated to performance, it is also possible that these relationships could be explained by the presence of an underlying variable. For example, both age and rank might be expected to correlate highly to an index of maturity of the subjects. It might also be expected that rank would correlate more strongly to maturity than would age. If maturity were then in turn highly correlated to procurement performance, then correlations between age, rank, and performance as were observed in this study would be expected. Thus it is possible that

selected combinations of biographical items could be considered to be measurements of psychological traits.

The basic purpose of this thesis was to provide a means to improve the quality of Department of Defense procurement actions by developing a technique for identifying and selecting those individuals for procurement positions whose biographies and traits indicate that they would excel in the procurement field. Although the results of this study did not produce a highly refined and reliable technique for identifying potentially superior procurement personnel, the results of this study did indicate that further research in this area is warranted and that additional research could be expected to produce such a technique.

APPENDIX A

JOB PERFORMANCE RATING SCALE

JOB PERFORMANCE RATING SCALE

INSTRUCTIONS

1. Please provide the following information on the officer you are rating:

   A. His rank _____
   B. The initial of his last name _____
   C. The last four digits of his social security number _____

2. Please read the items below and evaluate the demonstrated performance of the officer identified above. The information in paragraph #1 above will only be used to pair this rating with the test taken by the rated officer. Since your responses will in no way be used in any personnel action, nor be associated with either your identity or the identity of the officer you are rating, rate his performance very carefully and frankly. For each item, rate his performance only on that factor. Please do not discuss this questionnaire with, or reveal your ratings to, the officer being rated.

Using the rating scale provided, place next to each item the numerical value of the description that best describes the officer's (ratee's) performance. Keep in mind a rating of zero (0) or one (1) indicates the ratee is doing a fair job with respect to the attribute described; and that an eight (8) or nine (9) indicates the ratee is doing an outstanding job with respect to the attribute described. A rating of two (2), three (3) or four (4) indicates the ratee is doing a good job; and a five (5), six (6) or seven (7) indicates superior performance with respect to the attribute. Be sure to assign a rating for each item listed.

Fair		Good			Superior		Outstanding		
0	1	2	3	4	5	6	7	8	9

1. The officer conducts his business on a high moral plane. In this respect the officer is: ____

2. The officer emphasizes the use of two or more competitive bids for each contract. In this respect the officer is: ____

3. The officer recognizes the relative importance of problems and puts them in proper perspective. In this respect the officer is: ____

4. The officer is well acquainted with Air Force methods of inspection and has good contact with government inspectors. In this respect the officer is: ____

5. The officer contracts for materials which constantly meet the minimum quality specified. In this respect the officer is: ____

6. The officer easily adjusts to frequent change. He is flexible in his thought process. In this respect the officer is: ____

7. The officer's actual costs are generally close to estimated costs. In this respect the officer is: ____

8. The officer negotiates firm delivery dates. In this respect the officer is: ____

	Fair		Good		Superior		Outstanding		
0	1	2	3	4	5	6	7	8	9

9. The officer protects the Air Force from losses resulting from poor quality (ie. return expenses, excess scrap). In this respect the officer is: ____

10. The officer provides assistance in developing specifications. In this respect the officer is: ____

11. The officer is very adept and successful in price negotiations. In this respect the officer is: ____

12. The officer is involved in activities to improve his procurement skills. In this respect the officer is: ____

13. The officer is aware of package costs and assists in establishing packaging specifications. In this respect the officer is: ____

14. The officer keeps his supervisor informed on all important matters and prepares data or furnishes information when asked. In this respect the officer is: ____

15. The officer uses value analysis or other evaluation methods to determine the target cost. In this respect the officer is: ____

16. The officer is aware of the problems of production and scheduling. He considers them when establishing delivery dates. In this respect the officer is: ____

17. The officer spends adequate time with the engineering office concerning quality requirements. In this respect the officer is: ____

18. The officer formulates new ideas or methods for accomplishing objectives. In this respect the officer is: ____

19. The officer is aware of documentation costs and assists in establishing the amount of documentation required. In this respect the officer is: ____

20. The officer is abreast of potential and immediate problems his contractors have in order to avoid late delivery. In this respect the officer is: ____

21. The officer is able to persuade a department to accept substitutes that will reduce costs for the government. In this respect the officer is: ____

22. The officer follows directions and takes appropriate action with the minimum amount of supervision. He does this promptly and efficiently, and the results are satisfactory. In this respect the officer is: ____

23. The officer expresses himself in meetings and briefings so that others understand him clearly. In this respect the officer is: ____

24. The officer realizes the problems of the people with whom he works. He handles them in such a manner that each person he deals with is left with a feeling that his problem has been adequately resolved. In this respect the officer is: ____

APPENDIX B

PERFORMANCE WEIGHTING SCALE
OVERALL PERFORMANCE RATING

DIMENSIONS OF PROCUREMENT

There are several aspects of procurement that an individual may emphasize in the performance of his duties. These aspects can be summarized in the following five dimensions:

1. Price - finds and negotiates the lowest cost
2. Quality - procures goods that meet the highest standards.
3. Suitability - procures goods that are best in terms of their intended use.
4. Delivery - schedules cause no problems with production or planning.
5. Management - aids the supervisor in the efficient operation of the organization.

The relative importance of each of these dimensions may be expressed by assigning a percentage to each dimension. For example, a hypothetical procurement officer might rate the five dimensions as follows:

Price	25%
Quality	30%
Suitability	15%
Delivery	10%
Management	20%
Total	100%

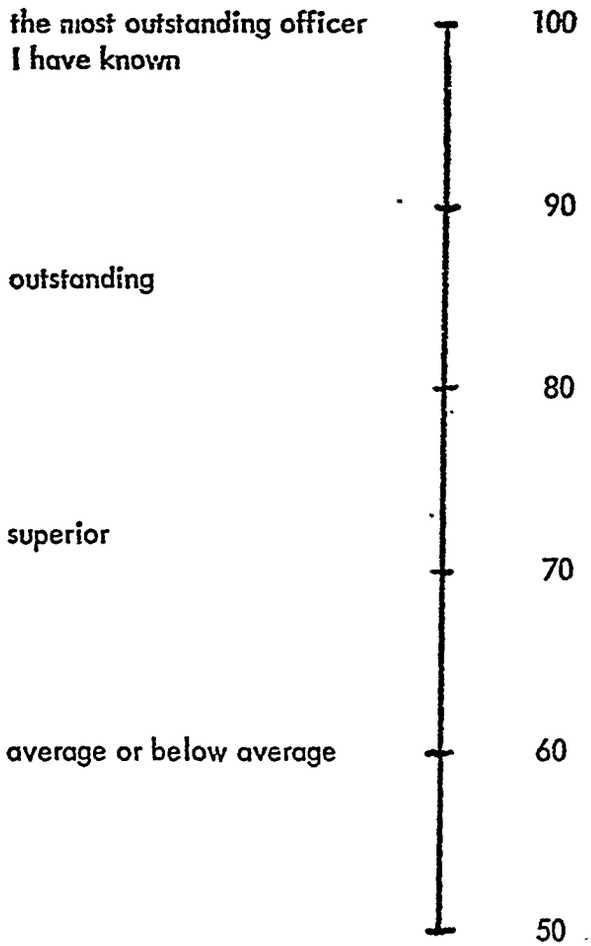
Please indicate the relative importance of these dimensions as they pertain to the mission of your organization by assigning a percentage to each dimension.

Price	___%
Quality	___%
Suitability	___%
Delivery	___%
Management	___%
Total	100 %

OVERALL PERFORMANCE RATING SCALE

INSTRUCTIONS

Please indicate on the scale below your overall impression of job performance of the procurement officers that you will rate. Indicate your impression by placing the officer's last name initial and the last four digits of his social security number to the right of the scale. It is important that no two officers receive the same rating, but it is possible that two or more may be very close on the scale.



APPENDIX C

PREDICTOR MEASUREMENT SCALE

PROCUREMENT OFFICER SURVEY

This questionnaire is part of a research effort aimed at developing a composite profile of an outstanding procurement officer. Your cooperation in this effort is greatly appreciated.

Please complete the following items of biographical data:

1. Age: _____

2. Rank: _____

3. Years of Military Service: _____

4. Years of experience in the Procurement career area: _____

5. Types of Procurement assignments:

   A. Base Level

   _____ Yes, for a total of _____ years.
   _____ No

   B. Depot Level

   _____ Yes, for a total of _____ years.
   _____ No

6. Educational Experience:

   Place a check (✓) next to type of degree (or degrees) which you hold:

____ B.S.	____ B.A.	____ M.S.
____ M.A.	____ M.B.A.	____ P H D.
____ None	____ Other _____ (please specify)	

7. Undergraduate Major:

   Place a check (✓) next to your undergraduate major.

____ Business	____ Accounting	____ Marketing
____ Economics	____ Social Science	____ Physical Science
____ Engineering	____ Humahities	____ None
____ Other _____ (please specify)		

8. Are you currently enrolled in an academic course?

____A. Yes, undergraduate level.
____B. Yes, graduate level.
____C. No.

9. Professional/Technical Training:

Place a check (✓) next to each course which you have completed:

____A. Defense Procurement Management (5 weeks).
____B. Contract Administration (4 weeks).
____C. Industrial Property Administration (3 weeks)
____D. Cost and Price Analysis and Negotiation Technique (3 weeks)
____E. Two-Step Formal Advertising/Multi Year Procurement (2 days)
____F. Defense Advanced Procurement Management (3 weeks)
____G. Contract Law (2 weeks)
____H. Art and Technique of Negotiating Contract Modifications (1 week)

10. Source of Commission:
____A. ROTC
____B. OTS/OCS
____C. Service Academy
____D. Other _____
(please specify)

Please read the items below and indicate how well each statement describes you by placing a number to the right of the statement in the space provided. If the statement describes you very accurately, place a one (1) to the right of the statement. If the statement describes you very inaccurately, place a five (5) to the right of the statement. A two (2) means the statement describes you fairly accurately, a three (3) means the statement is neither accurate nor inaccurate, and a four (4) mean the statement is fairly inaccurate.

Very Accurate	Fairly Accurate	Neither Accurate Nor Inaccurate	Fairly Inaccurate	Very Inaccurate
1	2	3	4	5

11. In meetings of groups to which I belong I often find myself trying to get things organized. ____

12. I occasionally tell strangers about things I am interested in without direct questions from them. ____

13. I like it when I know so well what the group has to do that I naturally become the one in command. ____

Very Accurate	Fairly Accurate	Neither Nor Inaccurate	Fairly Inaccurate	Very Inaccurate
1	2	3	4	5

14. I think I am better described as polite and quiet than as lively and active. ____

15. When a speaker asks anyone in the audience to volunteer an idea to start discussion, I seldom speak out. ____

16. In playing games when young, I ofter took the lead and decided what the group should play. ____

17. More than the average person, I try to attain recognition in groups of which I am a member. ____

18. I almost never tell strangers about anything I am interested in unless they ask me about it. ____

19. I am pleased when my boss or superior leaves me in charge of the group. ____

20. I have sometimes been described as a rather headstrong person, following my own ideas regardless of the opinions of others. ____

21. My friends often refer to me as a conformist. ____

22. If I disagree with the teacher or lecturer in a class, I generally openly express my difference of opinion. ____

23. I usually take the initiative in opposing the "bossy" way some chairmen conduct meetings. ____

24. I make my own decisions, uninfluenced by the opinions of others. ____

25. I enjoy taking the lead in group discussions. ____

26. At accidents or fires, when there are several persons present, I as a rule take an active part in assisting. ____

27. In a mixed social group, where many people are strangers to each other, I frequently constitute myself as host and begin introductions and conversations. ____

28. If I disagree with someone, I rarely let them know that I disagree. ____

29. At dull parties, I frequently take the initiative in trying to inject some life. ____

30. When riding on a bus or train, I seldom take the initiative in starting a conversation with a seatmate with whom I am unacquainted. ____

Very Accurate	Fairly Accurate	Neither Accurate Nor Inaccurate	Fairly Inaccurate	Very Inaccurate
1	2	3	4	5

31. As a rule I am relaxed in the presence of my superiors. ____

32. In group situations I am quick to take the lead when an opportunity presents itself. ____

33. As a rule, I am content to sit back and let others be the leaders. ____

34. I probably would be considered somewhat "authoritaritan" in my behavior towards others. ____

Please read the following statements and indicate your agreement or disagreement with them by placing a number, from one (1) to five (5) after each item, according to the following scale:

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	2	3	4	5

35. It is very difficult to be friends with a person who disagrees with one's own beliefs. ____

36. I sometimes argue for things which I do not believe, just to promote a lively discussion. ____

37. People in general spend too much time arguing about things which do not make too much difference anyway. ____

38. In the interests of harmony, it is often necessary to pretend to agree with others, even when you do not. ____

39. People who have the same attitudes and opinions as myself tend to be rather boring at times. ____

40. Class discussions, where conflicting points of view are expressed, are usually more beneficial to learning than are lectures. ____

41. So called friendly discussion of controversial issues too often result in hard feelings. ____

42. It is quite interesting and beneficial to discuss politics and religion with people who have quite different views from one's own. ____

APPENDIX D

PERFORMANCE SCORES BY SUBJECT

Performance Scores by Subject

Subject Number	Performance Scores			
	Individually Weighted	Overall Weighted	Adjusted Individually Weighted	Adjusted Overall Weighted
1	84	81	74	73
2	85	79	75	71
3	70	67	60	59
4	80	79	71	72
5	71	72	62	65
6	68	71	60	63
7	71	71	62	64
8	72	73	63	66
9	85	82	76	75
10	76	72	68	64
11	76	73	68	64
12	87	79	78	72
13	84	76	75	68
14	86	79	77	71
15	84	76	75	69
16	84	74	75	67
17	74	68	-	-
18	72	67	-	-
19	63	61	-	-
20	70	69	-	-
21	67	64	-	-
22	71	64	-	-
23	75	72	-	-
24	52	51	-	-
25	52	51	-	-
26	78	76	69	68
27	79	77	71	68
28	80	77	71	69
29	71	68	63	60
30	85	82	76	73
31	64	63	69	67
32	66	64	-	-
33	43	41	-	-
34	82	77	-	-
35	57	55	-	-
36	66	68	83	78
37	64	71	81	81

Performance Scores by Subject

Subject Number	Performance Scores			
	Individually Weighted	Overall Weighted	Adjusted Individually Weighted	Adjusted Overall Weighted
38	64	70	81	81
39	55	52	71	63
40	50	48	66	59
41	37	46	54	56
42	37	45	53	56

APPENDIX E

PREDICTOR RESPONSES BY SUBJECT

Predictor Responses by Subject

Subject Number	Predictor						
	Age	Rank (see note)	Years of Military Service	Years in Procurement Field	Technical Training (total courses)	Individual Prominence	Tolerance of Disagreement
1	33	04	11	1	0	68	19
2	23	01	5	1	0	53	24
3	27	03	4	4	1	51	20
4	28	03	5	3	2	50	19
5	28	03	5	4	0	65	17
6	24	02	2	2	0	65	14
7	25	02	2	2	3	69	19
8	24	02	1	1	1	58	17
9	33	03	14	4	1	67	19
10	34	04	12	2	0	42	29
11	28	03	4	4	0	56	21
12	31	03	9	9	1	50	17
13	34	04	13	6	2	36	22
14	35	04	11	6	0	55	26
15	25	03	3	1	0	57	22
16	33	04	10	1	0	52	15
17	28	03	6	2	1	68	22
18	31	03	11	10	2	51	21
19	25	03	4	2	1	55	23
20	28	03	4	4	0	73	21
21	25	03	4	4	2	63	17
22	24	01	2	1	0	57	12
23	26	03	3	3	3	56	22
24	32	03	11	1	1	49	19
25	27	03	5	5	4	73	22
26	27	03	6	4	0	65	19
27	30	01	12	1	0	63	24

Note: 01 refers to a Second Lieutenant
02 refers to a First Lieutenant
03 refers to a Captain
04 refers to a Major

Predictor Responses by Subject

Subject Number	Predictor						
	Age	Rank (see note)	Years of Military Service	Years in Procurement Field	Technical Training (total courses)	Individual Prominence	Tolerance of Disagreement
28	32	03	10	10	2	63	22
29	33	03	14	4	0	64	18
30	29	03	7	6	1	66	28
31	24	02	1	1	0	51	14
32	31	03	8	2	0	65	23
33	23	01	5	1	3	49	23
34	24	01	1	1	0	66	25
35	23	01	1	1	1	60	21
36	32	03	10	10	2	61	20
37	25	02	2	2	1	62	23
38	25	02	2	2	1	62	23
39	31	03	5	5	3	77	27
40	26	03	4	4	2	55	18
41	32	01	12	1	0	58	24
42	23	01	1	1	0	61	23

Note: 01 refers to a Second Lieutenant
02 refers to a First Lieutenant
03 refers to a Captain
04 refers to a Major

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